

PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Improvements in the Moulding of Spherical Objects, such as Tennis or Golf Balls

I, LEONARD JAMES BRYDON, British Nationality, of 37, Dovercliffe Road, Liverpool 13, Lancashire, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to the manufacture of spheres of rubber, plastics substances, and other mouldable substances, as used for example in the manufacture of tennis balls, golf balls, play balls, and the like, and has for its object to expedite and reduce the cost of manufacture of such articles.

Conventionally, spheres, as referred to, each are formed in two hemispherical parts, each separately moulded by male and female dies, and which so-formed parts require subsequently to be trimmed, buffed, treated with an adhesive, attached together in pairs, and vulcanised, to form a complete sphere. Such a method of manufacture entails, obviously, a relatively large number of lengthy manufacturing steps.

To reduce the length of time and cost of manufacture of such spheres, the method of the present invention broadly comprises, a) leading a strip, or strips, of mouldable substance as it issues from an extruding machine in a hot and tacky state over a mould formed in two planar co-operating parts each of which is formed or provided with at least one hemispherical depression or female die, b) moulding the strip or strips into said female dies by means of displaceable male die members situated for co-operating one with each of said female dies, and c) bringing together the mould parts so that the female die or dies of one mould part become coincident with the female die or dies of the other part and whereby the strip, or strips, lining said dies is folded, or brought together,

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and bonded into a single strip incorporating a sphere or spheres. When the mould is opened the formed strip is advanced into a water or other bath to cool same and from thence is moved to a trimming machine adapted to block out the now formed hollow spheres from the strip. Curing of the spheres and their subsequent covering or treatment can be effected in conventional or other manner.

The invention is further described with the aid of the accompanying explanatory drawings which illustrate schematically, and by way of example only, two modes of embodiment.

In said drawings:—

Figs. 1 and 2 are perspective views illustrating two steps in the moulding of a single strip of mouldable substance,

Fig. 3 is a cross-sectional view of the mould whilst in open state, and

Fig. 4 is a cross-sectional view of the mould when closed.

Fig. 5 is a view similar to that of Fig. 1 but of an alternative mode of embodiment.

Referring now to said drawings, and first to Figs. 1 to 4 inclusive, the numeral 10 denotes a strip of, say, uncured rubber which has been extruded in say conventional fashion from an extruding machine, and is in a hot and tacky state, so as to overlie a mould 11 comprising two planar co-operating parts 12, 13 which, in this instance, are hingedly connected as at 14. Said mould parts 12, 13 are formed or provided respectively with hemispherical depressions, or female dies, 15, 16. Above said mould 11 there are provided male die members or punches 17, 18 arranged for reciprocation so as to mould the strip 10 into the female dies 15, 16 thereby to form in said strip 10 a pair of hemispherical depressions 19, 20. Said male

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and female dies are accurately dimensioned and controlled so that the substance lining said female dies 15, 16 is of an accurate predetermined thickness. Subsequent to the operation of the said male dies 17, 18, the mould parts 12, 13 are brought together (Fig. 4) so that the strip 10 is folded as shown into about half its original width and whereby the hemispherical depressions 19, 20 are brought accurately into aligned and registered contact and become bonded one to the other by reason of their hot and tacky condition to form spheres 21. The mould is then opened and the strip 10 is advanced so as to pass through, say, a cooling bath of water, or the like, and from thence to a trimming machine adapted to block out the air-filled spheres from the strip. The so-formed spheres can be cured in any suitable manner as found convenient and covered or otherwise finished as desired and according to requirements.

According to one mode of embodiment the female dies 15, 16 are constituted by appropriately configured inserts fitted into the mould parts 12, 13 and adapted for axial displacement, preferably spring-influenced, relative thereto. The mould parts 12, 13 are hingedly connected so as to provide a clearance between their opposed faces when closed, the actual bonding together of the folded strip being effected by displacement of the female die inserts. Thus arranged, the hemispherical depressions 19, 20 of the strip 10 can more easily be arranged so as to be accurately located relative to each other when brought into contact and the bonding operation thereby effected without danger of the finished product being of distorted shape.

In Fig. 5, in lieu of a single strip 10 of mouldable substance as referred to in relation of Figs. 1 to 4 of the drawings, two extruded strips 10a, 10b are arranged so as to pass over co-operating mould parts 12a, 13a. Vertically displaceable male die members 17a, 18a are provided adapted to mould the strips 10a, 10b into female dies 15a, 16a of said mould and subsequent to such operation the mould parts 12a, 13a, are brought together to bond the two strips one to the other to form a single strip 10c incorporating hollow air-filled spheres 21.

Apparatus for carrying out the invention may be of rotary nature and comprise a wheel (not shown) rotatable about a horizontal axis and adapted to be driven intermittently as by an electro-motor. The periphery of said carrier is formed or provided with a series, for example eight, stations each of which is apertured or slotted so as to permit the adjustable attachment thereto of pairs of co-acting planar moulds (as for example 12, 13 of Figs. 1 to 4). Each planar mould part may be formed with one or a plurality of co-operating hemispherical depressions or

female dies. Adjacent to said wheel there are disposed a series of displaceable male die members (as 17, 18 of Figs. 1 to 4) one in respect of, and in register with, each female die of the mould.

Said wheel is adapted to be rotated step-by-step so as to feed forward a mouldable strip (as 10) issuing from an adjacent extruding machine, said strip being laid successively over co-acting pairs of mould parts. The male die members are adapted for operation in timed relationship with movement of the carrier, e.g. by fluid operable or electro-mechanical mechanism, so as to line the female dies of each mould as it becomes located for the time being below said dies. During the subsequent step-by-step movement of said carrier wheel said co-acting mould parts are successively closed to complete formation of air-filled spheres in the strip or strips laid over same, and opened to permit detaching therefrom of the strip for cooling and trimming purposes.

Said wheel may consist of a circular metal frame structure journaled so as to rotate in a vertical plane between side plates and said side plates may have mounted thereon platforms or shelves or brackets on which may be supported power tools or the like adapted for automatic or manual operation in use and maintenance of the apparatus.

Alternatively, apparatus for the purpose specified may be arranged lineally with means for progressively indexing a strip or strips of mouldable substance into and out of operative engagement with co-acting mould parts.

It will be seen that the invention facilitates the manufacture of spheres of rubber or rubber like, or plastics substances in that mouldable strip may be formed, more or less continuously, with spheres as it issues from extruding apparatus.

It is of course to be appreciated that cores or fillings may be introduced either by hand or automatically into spheres manufactured according to the invention at any appropriate stage in the manufacturing process, e.g. just prior to closing of the co-operating mould parts.

WHAT I CLAIM IS:—

1. A method of forming spheres which comprises, leading a strip, or strips, of mouldable substance in a hot and tacky state over a mould formed in two co-operating planar parts each of which is formed or provided with at least one hemispherical female die or depression; moulding the strip or strips into said female dies by means of displaceable male die members or punches situated for co-operating one with each of said female dies, closing said mould parts so that the die or dies of one part become coincident with the die or dies of the other part and whereby the strip or strips lining said dies is folded

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- or brought together and becomes bonded into a single strip incorporating spheres; opening said mould parts; cooling the moulded strip; and blocking out and curing the formed spheres.
- 5 2. A method of forming spheres from mouldable strip material or substance as claimed in claim 1, including the step of introducing to one or other of the lined female dies a substance or core to be enclosed in the subsequently formed sphere.
- 10 3. A method of forming spheres, substantially as herein described with reference to Figs. 1 to 4 of the accompanying drawings.
- 15 4. A method of forming spheres, substantially as hereinbefore described with reference to Fig. 5 of the accompanying drawings.
5. Apparatus for forming spheres from mouldable substance in strip form substantially as hereinbefore described with reference to Figs. 1 to 4 of the accompanying drawings.
- 20 6. Apparatus for forming spheres from mouldable substance in strip form, substantially as hereinbefore described with reference to Fig. 5 of the accompanying drawings.
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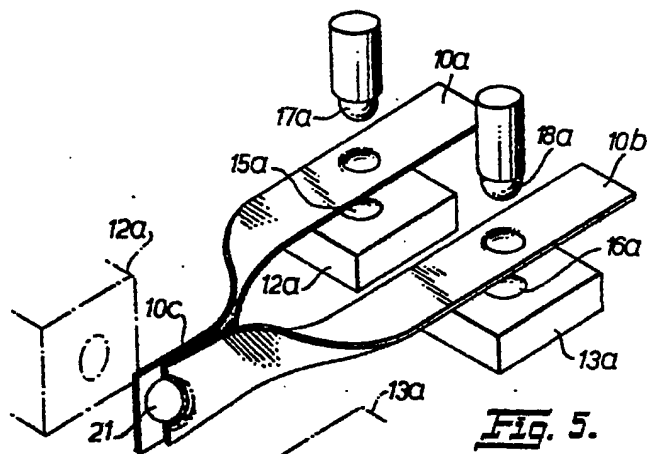


Fig. 5.

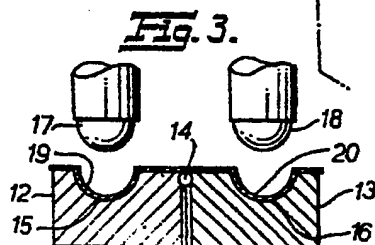


Fig. 3.

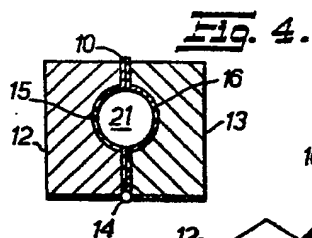


Fig. 4.

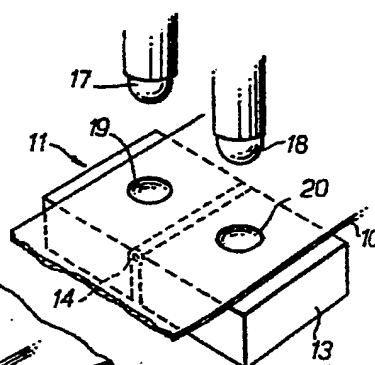


Fig. 1.

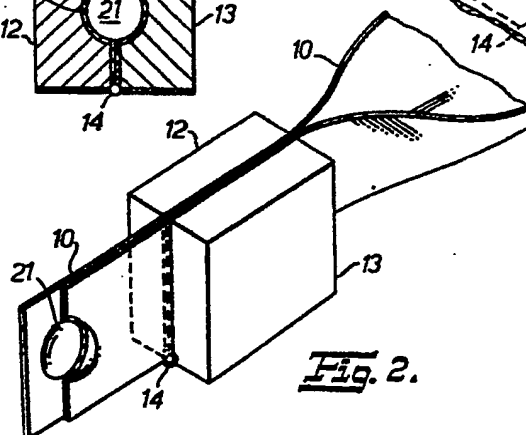


Fig. 2.